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THE COLOR OF FISHES.

THE skin of a fish, upon the structure of which its color depends, consists of two layers,—the outer, or epidermis, delicate, transparent, and not supplied with blood-vessels; the inner, the corium or dermis, laminated and elastic, varying in thickness in different species and in different parts of the body, and permeated by blood-vessels and nerves. Between the skin and the underlying muscles is a layer of loose connective tissue, often loaded with fat, especially in the mackerels and salmonoids and in the herring tribe. In the menhaden this layer is thick, hard, and blubber-like.

The scales are modifications of the dermis, and are ordinarily thin, transparent, horny plates, with rounded quadrangular outlines, which are partially embedded in folds or pockets in the dermis, and covered by the epidermis, through which, however, their tips protrude. The scales are usually

SECTION OF THE SKIN OF A FISH.
a, epidermis; *b*, scales; *c*, dermis.

imbricated, overlapping each other like the shingles on a roof, but are sometimes separated and embedded, and partly hidden in the skin, as in the eel.

In fishes which live near the bottom and among the rocks, such as the sea-bass, red snapper, sheephead, and perch, the scales are usually thick, hard, closely imbricated, and deeply set in their sheaths, forming an impermeable coat-of-mail.

In fishes which live in the mud, such as the tautog, the burbot, and the carp, the scales are usually covered by thick layers of epidermis and mucus.

In fishes which swim free and far from shore, such as the herrings and the lake white-fishes, the scales are attached merely by a small area of their rims, and, being but slightly covered with epidermis, are easily rubbed off. Scales thus removed are in many fishes easily renewed.

The smooth polished surface of the closely set scales offers little resistance to the motion of the fish as it glides swiftly through the water.

The exposed surface of the ordinary fish-scale is usually covered with a thin silvery coating, which derives its brilliant metallic lustre from the presence of numerous crystals of a combination of guanin and lime. This coating may readily be loosened and rubbed off, and in one European fish, the bleak or ablette, a member of the carp family, the crystals are sufficiently abundant to become the source of the metallic pigment known in the arts as *essence d'Orient*, or argentine, which is used to impart a nacreous lustre to the glass globules sold under the name of "Roman pearls." When the silvery coating is absent, scales are lustreless and transparent, as in the smelt, the abdominal cavity of which, however, has a brilliant silvery lining composed of the same substance.

CRYSTALS FROM THE SILVERY COATING OF A FISH-SCALE (MAGNIFIED 600 TIMES).

The colors of fishes are very varied, and often exceedingly brilliant and beautiful. "Aucune classe d'animaux n'a été aussi favorisée à cet égard," says Lacépède; "aucune n'a reçu une parure plus élégante, plus variée, plus riche; et que ceux qui ont vu, par exemple, des zées, des chétodons, des spares, nager pres de la surface; d'une eau tranquille et réfléchir les rayons d'un soleil brillant, disent, si jamais l'éclat des plumes du pœon et du colibri, la vivacité du diamant, la splendeur de l'or, le reflet des pierres precieux, ont été mélés à plus de feu, et ont renvoyé a l'œil de l'observateur des images plus parfaites de cet arc merveilleusement colorie dont l'astre du jour fait souvent le plus bel ornament des cieux."

The colors are often due to a simple arrangement of pigment cells, placed at different depths in the skin; but those changeable and brilliant hues which constitute the greatest beauty of fishes are dependent, as Pouchet and others have shown, upon two very dissimilar causes.

One of these, which may be well observed in the scales of the herring, shad, or mackerel, is a true iridescence, similar to that seen in the pearl or in antique glass, and due to the refraction of the rays of light as they glance off the surfaces of thin plates or ridges in the scales. This is called "lamellar coloring." There are certain bodies called "iridocytes" (rainbow plates) embedded in the epidermis which have an important function, it is said, in this iridescent play of colors.

The coloration is, however, chiefly dependent on the arrangement of the pigment-cells, or chromatophores, which lie in the lower strata of the epidermis. These are black, yellow, and red; the latter, according to Pouchet, being capable of dimorphic changes into blue and green. The combinations of the various-hued chromatophores with the metallic crystals of silver, the white of the bony scale-plates showing through the epidermis, and the iridocytes already referred to, produce the coloration of every kind of fish.

An embryonic fish is colorless; but the pigment-cells of black, yellow, and red soon begin to appear, as is shown in Alexander Agassiz's beautiful plates of the early stages of flounders and other species, published in the "Bulletin of the Museum of Comparative Zoölogy." When the black pigment predominates, the color is sombre, as in the adult tautog, *Tautoga onitis*. A slight admixture of yellow gives the bronze-like hue of the eel, and a little more of the same results in the brighter green of the black-bass, the blue-fish, and the cunner. In all of these there is a sprinkling also of red, giving the warmer brownish greens so often seen in these species. Red pigments intermixed with black give the dingy browns of the carp, the sculpins, and some of the cat-fishes. When the yellow and red outnumber the black cells, there result the tawny colors of the sand-dabs, the sun-fishes,

the cusks, and the ling, and of some varieties of the cod. Red chromatophores alone cause the brilliant scarlet of the red snapper and the rose-fish, and, when these are interspersed with black, the deeper colors of the mangrove snapper and the ruddy variety of the sea-raven. When the chromatophores begin to segregate into separate groups according to color, the result is the formation of bands, stripes, spots, and shadings infinite in their possibilities of mutation and combination, and quite beyond the power of words to describe.

The entire absence of chromatophores results in albinism. I have already called attention to the curious albino haddocks occasionally taken on our coast. Sometimes these are of a light golden color, and are in what Günther calls a state of "incipient albinism," the dark pigments having changed into yellow. This has been observed also in flounders, carps, and eels, and in the gold-fish, which in its native haunts in China is a dull green. The golden orfe and the golden ide have become permanent in a state of domestication. The silver-fish, a form of gold-fish, is an example of still more complete albinism; and a combination of the two conditions is very common in the breeding-ponds of the United States Fish Commission.

The blind-fish of Mammoth Cave, *Amblyopsis spelæus*, is an illustration of permanent adaptive albinism; and in the abysses of the sea, where the light is very scanty, many fishes appear to remain permanently in this condition.

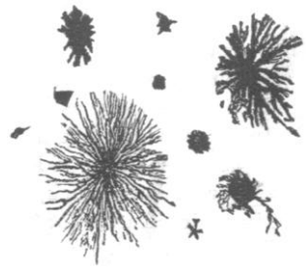
Adaptive coloration seems to be possible in quite another way, through the secretion of pigment-cells, which permanently change the color of the fish to make it harmonize with that of the bottom upon which it lives. On certain ledges along the New England coast the rocks are covered with dense growths of scarlet and crimson seaweeds. The cod-fish, the cunner, the sea-raven, the rock-eel, and the wry-mouth, which inhabit these brilliant groves, are all colored to match their surroundings; the cod, which is naturally lightest in color, being most brilliant in its scarlet hues, while the others, whose skins have a larger original supply of black, have deeper tints of dark red and ruddy brown. These changes must be due to the secretion of a special supply of red chromatophores. It has occurred to me that the material for the pigmentary secretion is probably derived indirectly from the algæ, for, though the species referred to do not feed upon these plants, they devour in immense quantities the invertebrate animals inhabiting the same region, many of which are likewise deeply tinged with red. Possibly the blacks and greens which prevail among the inhabitants of other colored bottoms are likewise dependent upon coloring-matter which is absorbed with the food. Günther believes that the pink color in the flesh of the salmon is due to the absorption of the coloring-matter of the crustaceans they feed upon. Spoonbills and flamingoes lose the brilliant pink tints of their feathers after long confinement in menageries, and it is customary for European zoölogical gardens to send them to the garden at Rotterdam to be recolored. It is not known how this is done, but it is supposed that they are fed upon some red-hued crustacean there obtainable.

The brilliant coloration of many kinds of fishes during the breeding-season may possibly have a relation to sexual selection; indeed, this can scarcely be doubted by any one who has observed the peacocking moments of male fishes. It has also a physiological significance which it is not difficult to comprehend. The increased brilliancy is usually most manifest in those parts of the body which lie close to the reproductive organs, in the belly, which is often flushed and vivid in color, in the ventral fins, and in less degree in the sides of the body and the posterior and lower parts of the head. The entire vascular system is in a condition of extreme activity at this time, as is evident from the manner in which outgrowths of the head and teguments are so rapidly developed. Every pigment-cell is receiving an unusual supply of blood, and its more abundant nutrition is, in part at least, the cause of its brilliancy.

If an abundant supply of blood results in an increase in brilliancy, its withdrawal from the teguments, on the other hand, causes an immediate decrease. I have often watched the large brightly striped "groupers," *Epinephelus striatus*, confined in the crystal fish-pools in Bermuda. When one of these had swallowed a large morsel of food, its color became almost instantly lighter and duller. This was evidently the result of the rush of blood to the stomach, to take part in the work of digestion: in like manner a man's face often becomes paler after he has eaten a hearty dinner.

The dulness and pallor in the color of fishes after death are due to the absence of living blood from the chromatophores. If, however, a fish not long dead is placed in the sun, its color will soon become almost as deep and bright as in life. In a few seconds it fades again, and cannot again be brightened.

This phenomenon leads to the consideration of another peculiarity in the arrangement of the pigment-cells, which renders rapid changes in hue possible in certain species. In these the pigments are associated with oily matter, and are arranged *areolæ*, which favor their approach toward or retreat from the surface of the skin. The accompanying diagram, drawn by Professor Benecke, shows how they may sometimes show as small, irregular spots upon the skin, and soon after become conspicuous star-shaped markings with far-reaching arms. Such changes may be effected by stimulation of various kinds, and even by the reflex action of the nerves under the influence of impressions of color received by the eye of the fish.



CHROMATOPHORES VARIOUSLY EXPANDED.

Every angler knows that trout inhabiting stagnant pools or dark bottoms are deep-colored, while those from deep, sunny waters are brighter. The same is true of many other fishes. I have often seen the common flat-fish change its color to that of the gravel and sand in which it was trying to hide, the hue varying as rapidly as that of the landscape when the sunlight is suddenly cut off by a passing cloud.

These changes of color are directly connected with the impressions of color received by the eye, and brought about by the reflex action of the nervous system. In no other way can changes such as those already referred to in flounders be accounted for. I have seen the tropical squid in Bermuda change color rapidly, and at will, while being pursued. This was evidently through the influence of emotion or fear, since it can hardly be supposed that there was definite purpose in the act; which, however, seemed at first sight to be intended to baffle its pursuers.

Pouchet experimented with young turbots, and found that if their eyes were blinded they did not change, thus proving that the color-cells were under the control of the

nervous system. Day records that young hybrid salmon raised at Howietoun, in which vision was more or less deficient, were observed to be generally lighter in color than their fellows.

The fishes of the sea are more often brilliant than those of the river or the lake. Warmth and light are favorable to brightness and variety of hue. The fishes of circumpolar regions, and those living at considerable depths, are therefore usually sombre, though occasionally they have iridescent scales or plates of great brilliancy.

In temperate regions, as along the coasts of the United States, sombre tones are most common, but in summer many sunny-hued strangers come up from the south.

In the tropical seas, however, the greatest beauty is to be found; and in some groups, such as the parrot-fishes and the wrasses, the most bizarre and astounding combinations of masses of brilliant color. Harsh and inharmonious as they seem, however, when imitated by the brush, they are never unpleasing in the living creatures. The West Indian fauna has many wonderful fishes,—such as the angel-fish, *Holacanthus ciliaris;* and the Spanish lady, *Bodianus rufus*,—but the utmost possibilities of beauty are to be found only in the Southern Pacific and the Indian Oceans.

As Count Lacépède has so eloquently shown in the passage already quoted, no class of animals has been so richly endowed with color as the fishes, except it may be the insects; and the effect of brilliancy in a fish is much greater on account of its larger size. Birds appear at a disadvantage in comparison, because, except in the metallic patches on the throats of the humming bird and a few similar instances, the surfaces of their feathers are not so well adapted to display as the broad burnished sides of fishes, kept constantly moist and lustrous by contact with water.

The beauty of fishes can only be known to those who have had the good fortune to see them swimming at ease, bathed in the limpidest of water and the brightest of sunshine. Aquaria are always dark and gloomy, and their glass walls seem more prison-like than the bars of a menagerie cage. Museum preparations do not tell of the vanished beauty even so well as the lifeless bodies of the fishes themselves, and every angler knows how suddenly the dead fish loses its attractions of texture and color. This change has been well described by Dr. Badham in the following lines:—

"While blazing breast of humming-bird and Io's stiffened wing
Are bright as when they first came forth new-painted in the spring,
While speckled snake and spotted pard their markings still display,
Though he who once embalmed them both himself be turned to clay,
On fish a different fate attends; nor reach they long the shore
Ere fade their hues like rainbow tints, and soon their beauty's o'er.
The eye that late in ocean's flood was large and round and full
Becomes on land a sunken orb, glaucomatous and dull:
The gills, like mushrooms, soon begin to turn from pink to black:
The blood congeals in stasis thick, the scales upturn and crack;
And those fair forms a Veronese, in art's meridian power,
With every varied tint at hand, and in his happiest hour,
Could ne'er in equal beauty deck, and bid the canvas live,
Are now so colorless and cold, a Rembrandt's touch might give."

G. BROWN GOODE.

NATURAL HISTORY GARDEN AND AQUARIA FOR BOSTON.

AT the meeting of the council of the Boston Society of Natural History previous to that held on Wednesday last, it was voted to recommend to the society, at its meeting of April 2, a resolution to the effect, that, in pursuance of the policy recorded in the vote of March 28, 1888, and adhering to the conditions therein required, the society authorizes the council, as soon as one-third of the final sum required for the establishment of its natural history garden and aquaria has been raised, to proceed with the establishment of the aquarium at City Point, in accordance with the plans laid down in the letter to the park commissioners of Dec. 31, 1889, which has received their approval. These plans will be best understood from this letter, which is in substance as follows:—

The Society of Natural History have been earnestly and constantly engaged in work upon matters connected with the foundation of natural-history gardens, since the receipt of the last letter of the commissioners, dated Dec. 30, 1887, and have finally concluded to offer the following as plans of what they deem to be best, hoping, if these are accepted, to follow up this first step very rapidly, so as to bring the matter speedily before the public. They propose to designate all the collections of living animals under their charge as the "Natural History Gardens," and to establish under this title three different divisions,—one to be called the "Marine Aquarium;" a second, the "Fresh Water Aquarium;" and the third, the "New England Zoölogical Garden;" these to be situated on grounds and to have buildings such as may be mutually agreed upon by the commissioners and by the society, in accordance with the provisions of the letter of the commissioners above referred to.

In compliance with the request of the park commissioners to present a statement of the proposed policy of the society in regard to the exhibits at the places designated by them,—namely, at City Point, near Jamaica Pond, and at Franklin Park,—the council offer for consideration the following general statement, and the outline of their plans with reference to each of the three divisions.

The attention of the commissioners is invited at the outset to the scientific and educational character of the plan of the Natural History Gardens. The three divisions of this department of the society's work, when regarded as a whole, form a connected series of exhibitions, which will, it is hoped, illustrate, more completely than has ever been done before, the relations of organisms to the four great regions of their distribution,—the sea, the fresh water, the land, and the air. The principle underlying the whole, and to which each part, however small, has been made to contribute, is the illustration of the relations of plants and animals to their surroundings. The council believe that a full exposition of the laws governing these correlations is the fittest use they can make of the opportunities offered by the commissioners, and the most valuable contribution which they and the commissioners acting together can bring to the cause of public education.

I. Marine Aquarium.

In the maps of the proposed Marine Park the lands and ponds assigned for the use of the society are admirably suited for the purposes of a large aquarial garden; and the council desire to express their satisfaction with these indications of the intentions of the commissioners, for they confirm the council in the opinion that it will be practicable to found a marine aquarium at this place which will be of unique excellence as an instrument of popular interest and education.

1. A collection of living organisms arranged and exhibited for the illustration of natural laws has a fuller effect if the minds of the students and visitors have been prepared by previous study, or, in place of this, if they have at hand a brief explanation of the general structure and relation of animals and plants to each other and to their surroundings.

The society propose to supply this explanation by means of an epitome collection, which, with a printed guide, shall explain the structure and relations of the more important subdivisions of animals and plants, the general adaptations of the structure of organisms to an aquatic existence, and the fact that under ordinary conditions, however diverse, the organisms retain their typical structures. This collection would consist of two classes of objects,—(*a*) a series of representative forms, including the principal types of animals and plants; (*b*) such general dissections and other anatomical preparations of selected types, accompanied by diagrams, as may enable the observer to grasp the fundamental points of the structure, physiology, and correlations of the animal

kingdom, but with special reference to those living forms which constitute the whole aquarial exhibit. These collections, being an introduction to the larger display, should occupy one room, serving also as the vestibule or entrance-hall in the main building.

2. The correlations between certain structures and parts in animals, and their habits and natural surroundings, can be illustrated by placing plants and animals that live on muddy, sandy, gravelly, or rocky parts of our own shores in separate aquaria, properly arranged and furnished. The suitability of organisms to the work they have to do could be illustrated in this and other ways, and clear ideas of one of the fundamental laws of organic modifications presented to intelligent visitors and students.

3. The extraordinary modifications which have taken place in the structure of the descendants of air-breathing land animals, in order to fit them for life in the sea, would be illustrated in the aquaria and also in the salt water ponds. These would be used for such seals, cetacea, and other marine animals as are either too large to be accommodated in tanks in the buildings, or which can be most appropriately exhibited in such enclosures. Adaptations equally fitting and instructive are found in birds which live upon the sea or its borders; and examples of these forms would be shown in the same ponds, or in appropriate places upon their margins.

4. It is well known that the distribution of plants and animals is limited more, perhaps, by temperature than by any other single cause. It is practicable to illustrate this great law of distribution with suitably constructed and properly arranged aquaria, stocked and kept supplied with animals and plants taken at moderate depths upon our own coasts. The problems connected with obtaining and handling animals gathered at great depths present difficulties with which no garden should attempt to cope until it is completely organized.

5. Faunal collections would compose the greater bulk of the marine aquaria. It is intended to group these together in such a way as to represent the association of the forms in their respective habitats. No attempt, of course, would here be made toward systematic grouping, but very dissimilar forms would be associated together, bringing prominently into view the geographical distribution of types. In one room of suitable size aquaria would be devoted solely to the marine plants and animals of the North Atlantic, from Cape Cod northward. As a part of this collection a series of aquaria would be maintained for the exhibition of the commoner plants and animals occurring on the coast of Massachusetts. These forms could be permanently supplied, and, being named and described in a proper guide book, would be of great interest to all persons living on the seashore. The fauna south of Cape Cod is in large part easy of acquisition, and could also be well represented in separate series of aquaria. The fauna south of Cape Hatteras and that of the western coasts of the United States, and other faunas, could also be exhibited, as opportunities presented themselves, either to a limited degree or more or less extensively, if the future progress and success of this division warranted the extension.

II. Fresh Water Aquarium.

It is obvious that an epitome collection is as desirable for the explanation of the relations of fresh-water plants and animals as of the marine.

1. The society would therefore form an epitome collection similar to that planned above for the Marine Aquarium; but this would necessarily differ in the details of its composition, fresh-water plants and animals being used instead of marine types. The adaptations of the structures of organisms to an aquatic existence would be exhibited by means of preparations of the gills, etc., as in the corresponding marine collection; but special adaptations to a fresh-water existence—such as the mode of reproduction of sponges, bryozoa, and some crustaceans by means of winter buds; the effects of desiccation upon some of these, and their mode of transportation from pond to pond; the contrasted structures of corresponding fresh-water and marine shrimps; the peculiarities of the batrachians, showing the transitions from a purely aquatic to a terrestrial type; and similar classes of facts—would be prominently illustrated. The fresh-water faunas of the globe are all secondary, or derived mainly from the marine faunas. This can also be approximately demonstrated in the epitome collection by placing side by side a certain number of marine and fresh-water animals in series or in pairs, including occasionally some fossils, in order to compare the existing *Amia*, gar pikes, etc., with their marine but now extinct ancestors.

2. Some of the most important results of research bearing upon the evolution of organisms have been attained by means of experimentation, and it is of the greatest importance for educational purposes that illustrations of such facts should he made accessible to teachers and students. The council would therefore aim at the repetition of some of these experimental observations, and make permanent exhibitions of the results. For example: a series of aquaria could be maintained, showing the gradual modification of the brine shrimp in passing from a saturated solution of salt, through ordinary salt and brackish waters, to a final lodgement in purely fresh water, where it becomes transformed into a well-known fresh-water type of crustacean; another series repeating Semper's experiments upon the snail, *Lymnœa stagnalis;* and still others showing the results of experimentation upon the development of the axolotl, salamanders, etc. This department would also include aquaria for the exhibition of the animals and plants now living in mineral or hot springs, the Caspian and Dead Seas, and other anomalous and more or less isolated positions, such as caves and subterranean rivers.

3. Fresh-water plants and animals are not wholly derived from the sea: many of them are modified descendants of terrestrial organisms that have changed their habitat and become suited to an aquatic existence. Some of the ponds would be used to exhibit this important fact, since in them the larger air-breathing animals that live on or in the fresh waters—such as the swimming and wading birds; the batrachians (frogs, salamanders, etc.); the reptiles (snakes, turtles, and alligators); beavers, muskrats, and possibly larger representatives of the mammalia from the tropics, such as the hippopotamus—could be confined. Some of these ponds would also be devoted to the exhibition of the *Liliaceæ* and other plants, which, although originally truly terrestrial and flowering plants, have become more or less modified and fitted for aquatic life. The huge leaves and flowers of the *Victoria regia*, and the lovely color of many of these annuals floating upon the glassy surface of the water, and framed in a shore growth of rushes and grasses, would form pictures of rare beauty and attractiveness.

4. Insects, although as a whole purely terrestrial and aerial, contain a number of groups that pass either a portion or the whole of their lives in water. An insectary would therefore be established, furnished with aquaria, placed in the midst of suitable plants, and surrounded by ample cages of netting for the confinement and display of the adults after they have passed through their transformations and have begun to fly. This part of the exhibit could be made exceedingly instructive by means of a printed guide, explaining the transformations of the insects shown in the aquaria and cages.

5. The fauna of our own fresh waters is apt to strike one at first as uninteresting: but it contains sponges, especially interesting to the public on account of their effect on the water-supply; many microscopical plants that can be cultivated in masses, so as to be seen by the unassisted eye; large bryozoa, such as *Pectinatella*, growing in heads like a brain-coral; bivalves and snails of respectable size; several interesting species of batrachians; and many fishes of remarkable structure and habits. The council would therefore bring together a series of aquaria exhibiting the animals of the fauna of New England and eastern Canada, and also keep in view the idea of explaining their more obvious relations to the water-supply of our cities. The fauna of the inland waters of the western and southern parts of North America is accessible, and should be shown, in so far as the more prominent forms are concerned, in a separate series of aquaria. Opportunities will perhaps be offered in the future for the acquisition of the larger and more interesting organisms of other faunas. These can be exhibited, provided the future success of this division justifies an extension of the plan.

III. New England Zoölogical Gardens.

The grounds at Franklin Park assigned by the commissioners for the use of the society are suited only to the third division of the Natural History Gardens,— the higher vertebrates or the larger terrestrial and aerial animals; and here, better perhaps than anywhere else, would it be possible to carry out one of the favorite projects of the supporters of the society, namely, such exhibitions as would familiarize the observer with the animals of New England. For in Long Crouch Woods is to be had not only a characteristic fragment of New England scenery and rock structure, but, by the limitations of the surface and of the territory, it would be impossible to make there any extensive display of foreign forms.

1. The council would exhibit fully the animals of the north temperate zone of the New World, limiting this zone to about eight or ten degrees of latitude on the parallels of New England, and thus display those which one might see at any point within the northern United States. All these animals could be cared for in such a place at the minimum expense, for their habits in a wild state have accustomed them to brave all the severities and vicissitudes of our climate. It being easier to obtain and to maintain the animals of this zone which are nearest home, it would follow that the great bulk of the collection at all times would be made up of animals characteristic of New England. But as thus one of the prime features of life upon the globe is necessarily touched upon,— its geographical distribution,— so may the lesson be made far more telling if to this assemblage be added just those animals (and no others) which in other faunas specially represent animals indigenous to New England. Thus, to instance one or two points, the council would exhibit side by side with the Rocky Mountain goat the chamois, structurally allied, adapted for and dwelling in similar mountain regions, characteristic of the Old as our own is of the New World; beside the cougar, or American panther, they would display the jaguar of South America; beside the black, the brown bear; while to correspond with the opossum, they would seek a relative, not in the more nearly allied marsupials of South America, but in the distinctive home of marsupials, among the strange forms which occur in Australia. As it would not be necessary to seek this counterpart for each animal, but in many cases only one for an entire series, as with the mice, hares, foxes, and so on, it will be seen that the collection would not be very largely increased, while its increase would be strictly limited, and its educational value greatly enhanced. It might be desirable to extend the collection in one or two instances; but in these only in the case of great groups, not represented in our own fauna, such as the ornithorhynchus of New Holland, and one, possibly two (or even three), of the quadrumana. Under such restrictions, which seem to be absolutely required by the extent to which the grounds at this point are limited, there would be a coherency and meaning to the collection which it would be difficult to find duplicated elsewhere, and it would be a means of exhibiting the characteristic features of the New England fauna and its relationships not easily accomplished in any other way.

The principal difficulty in carrying out even this limited plan is the insufficient surface suitable for such an exhibition. This is nowhere more manifestly true than as regards the ruminants; for within the limits of Long Crouch Woods itself it would be entirely impossible to display in any pleasing or profitable manner those largest forms among our quadrupeds which excite, perhaps, greater interest than any other, — the bison, moose, elk, caribou, deer. For this purpose it is absolutely essential that more ground be had, at least so far as a range is concerned. And this it is hoped the commissioners will grant whenever needed, perhaps in the ground which has been set apart as a deer park, in which it would be quite possible, by lines of wire fence practically invisible, to separate such bands as could not be brought into a common enclosure.

2. What has been said thus far relates principally to the terrestrial animals. Another mode of exhibition for the freer-moving, aerial creatures may be advantageously pursued. Thus it might be possible in a series of outdoor aviaries, sufficiently large to enclose good-sized trees, to bring together at their proper periods the characteristic summer or winter birds, so that one might see for himself what was the avifauna of New England at any given time. In others might be placed, as a permanent exhibition, such of the native breeding birds as would bear association, where they might find room enough, and suitable places, for all purposes of nesting and bringing up their young. The headlong flight of some birds might prevent their exhibition here. Similar aviaries for the exhibition of birds found in our north temperate zone west of New England should be placed side by side with those of New England itself; while the exhibition of foreign birds for comparative purposes, limited in the same way as those of the less freely moving vertebrates, would be more naturally disposed in the mode common in foreign gardens.

3. Long Crouch Woods, then, would be *par excellence* a New England exhibit; and such a display would naturally lose much of its interest in the winter time. If, however, there could be combined with this a winter garden situated in Sargent's Field, adjoining, cost alone would prevent it from becoming so attractive as to make it a constant place of resort at all times, and particularly during the colder months of the year. Here, in a large but simple structure of glass and iron, handsome rather in its proportions than through decorative attachments, warmed so as to have a very constant but not too high temperature throughout the winter, one would walk upon the unfrozen ground in a garden where varied and luxuriant vegetable forms would enable him to imagine himself in the midst of the tropics. The loftier vegetation, like the bamboos and certain palms, could be grouped in a higher central portion; while miniature ponds and fountains, reached by winding walks, would everywhere afford special nooks for aquatic or spray-loving plants. This could be enlivened still further with a very few of the more brilliant-plumaged birds and songsters in aviaries, aquatic birds on the ponds, and with here and there an enclosure containing some small creature, specially pleasing by its form or attractive by its habits,— a gazelle, a jerboa, perhaps a spider-monkey; a chameleon, a Surinam toad, or a garter-snake. The possibilities of such a scheme are fascinating; and the structure should be so arranged and situated that extensive additions could be made to it, and that it could be approached directly by conveyance to the door. An ordinary greenhouse would, of course, be necessary as an adjunct of the winter garden, for forcing plants for ornamental purposes.

4. An insectary should be built; and, both for economic reasons in construction and heating and for the convenient proximity of the necessary food-plants, it should be an annex to the greenhouse. Colonies of striking and curious insects, especially the social insects, undergoing their transformations, might be exhibited in a small, single-storied structure of glass and iron, like an ordinary conservatory, with no more flooring than would be required for passageways between the plants and shrubs. Such a collection would be inexpensive and attractive, and, without in any way curtailing its public use, would afford ample opportunity for scientific experimentation of an important kind. Pedigree breeding, for instance, or breeding in constant temperatures, whether high, low, or average, might here be carried on upon a large scale. Indeed, the opportunities are so great that the choice of subjects would be difficult, so many would claim attention; and it would be quite possible to display a changing round of attractive and instructive sights from week to week throughout the year.

The educational use that can be made of these three different divisions of the Natural History Gardens, forming one connected whole,—one in principle, but varying in details to suit the special needs of each division, and the adaptability of the separate locations,—will undoubtedly meet the requirements of the present, and also give the necessary freedom for enlargement or modification needed by future generations. It will be seen, also, that the New England element enters into each division in varying proportions, as circumstances permit, and to the greatest degree where the objects concerned are more commonly known, being most developed among the higher animals, with which, from their size and their relations to man, the public is more familiar.

The difficulties which surround the whole project,—in many

respects so novel as to offer no precedents. wholly new to those on whom the burden of the execution of the plan must fall,—as well as the great expense of the undertaking, have been subjects of long and thorough consideration by the council. These difficulties account for the delay in replying to the last communication of the commissioners. Their deliberations have finally brought the council to the assured conviction that it would be neither feasible nor wise to attempt to begin the three proposed divisions at the same time; and yet it is obvious that the work of the society in building up the department of Natural History Gardens should not be delayed. Although the sites proposed for the Marine Aquarium and the Fresh Water Aquarium will not be ready for occupation for some time, nevertheless it is the unanimous opinion of the council that the undertaking should begin with the Marine Aquarium. The proposed site of this division, the less proportionate expenditure for installation and maintenance, and its general interest to the public, combine to make it likely that it can be made a financial success, and thus contribute to the foundation and maintenance of the other departments

In order to meet these difficulties and make a beginning without unnecessary delay, the council suggest the propriety of starting a temporary marine aquarium on grounds already under the control of the commissioners, and therefore respectfully inquire of the park commissioners whether the establishment of a temporary aquarium at the Marine Park in South Boston would meet with their approval; and, if so, what part of the grounds and water-front now at their disposal could be allowed the society for that purpose.

The pumps, piping, and specimens would of course be serviceable for removal to the buildings and grounds of the permanent establishment; and, if thought advisable, it might be practicable to construct even the temporary building so that it could be taken down and rebuilt in another place, or easily removed to a new site.

A temporary garden of respectable proportions would require only a limited sum for buildings and machinery, and would probably prove remunerative; the society could also begin operations sooner, if a limited sum devoted to such uses could be asked for; and they could thus effectively start the work of exciting public interest in favor of their plans for the establishment of a fresh-water aquarium and a New England zoölogical garden, and probably advance with surer steps toward the establishment of these two divisions of the Natural History Gardens.

In view of these considerations, the council of the Boston Society of Natural History ask the approval of the park commissioners to the following proposition: namely, that they shall be allowed to begin operations as soon as they have raised a third part, more or less, as may be needed, of the proposed sum of two hundred thousand dollars, for the purpose of erecting and equipping a building for a temporary aquarium at Marine Park, on land to be granted by the commissioners of parks; said sum to be ultimately incorporated with the two hundred thousand dollars to be raised by the society for the establishment of the Natural History Gardens, but for the present, and as long as the temporary aquarium exists, to be considered as belonging to an independent foundation.

Little has been said about buildings in this communication, because it has been considered essential first to settle what the council as scientific men and the commissioners in their official capacity, both being equally interested in the cause of public education, would deem it best to do; and, second, because in all such undertakings the true basis should be sought in the exposition and teaching of principles. As will be seen, however, by all those who have followed the history of this undertaking, the plans have been made with due consideration of the advantages offered by the localities proposed for the three divisions; and their unique character and extent are fully justified by the unequalled opportunities offered by the commissioners for the founding of these great institutions, devoted to the entertainment and instruction of the people in the system of parks under their jurisdiction.

We hope to publish next week some account of the action taken by the Boston Society of Natural History at its meeting on April 2.

STAMMERING.

IN the *Provincial Medical Journal* of Feb. 1, 1890, is an anonymous letter from a physician, himself a victim to this unpleasant habit, which contains so many points of practical interest that portions of it are here reproduced from the *Medical Analectic*.

"Having lately received several circulars from different professors who advertise their secret methods for the cure of stammering, I have thought that a personal experience might be of interest and value. I shall not attempt a learned physiological analysis of the nerve-centres and nerves involved in the different muscles, and sets of muscles, in stammering, but rather aim at a simple statement.

"Since twenty years of age, I have been, though not wholly, yet fairly free from the trouble. In my earliest remembrance of speech, and all through my boyhood, I was a terrible stammerer. I have only heard of two epileptics in my family,—one a woman, a first-cousin; the other a boy, a second-cousin,—both on the father's side.

"The occasions on which I have stammered for thirty years past, and yet stammer, are about as follows: from habit acquired in travel, and in India, and to save the legs of the maid, I prefer to go out of my room, and call to the maid for what I may want. For two years I had a favorite maid called Mary. It was in vain for me to attempt to call out 'Mary!' My lips would compress, the upper teeth seizing the flesh inside the under lip. The word would not come without extreme and painful effort. But there was one way towards perfect relief: I always called 'O Mary!' i.e., I placed a vowel-breathing before the consonant, and thus unlocked the complex and inharmonious co-ordination of brain, nerve, and muscle involved in the production of *m*. In reading a lecture before a public audience, a terrible word is 'method.' Within the last ten years my upper teeth have made wounds inside the under lip in getting out this word. I naturally avoided the ridicule of inserting a vowel-sound before an audience. Another occasion on which I am still constantly bothered is in saying 'good-morning,' as I am shown out of a front-door by master or maid: something unduly glues my tongue over the *g* in 'good.' I get over this difficulty by bringing into operation another mental act, and the action of a different set of muscles, by the act of lifting my hat. I can say 'good-morning' without stammering while in the very act of lifting my hat. Here the same principle is involved as in putting a vowel before *m*: spasm of certain muscles is relieved by diverting nerve-energy to other channels and other muscles. Again: if I feel that I am about to stammer in any word, I try to substitute another word. Often in public reading, if I avoid the difficult word by some substitution, the same difficult word may recur many times, and I can speak it with little or no difficulty.

"If I am reading a lecture in public which is legibly written, and if I have previously read it aloud to myself, I shall stammer little or not at all: in other words, I do not stammer when the nervous system is calm. Similarly, if, speaking in a public discussion, I confine my mind to one simple point at a time, I do not stammer; but if the mind, in its active tumultuousness, sees too much or too widely the other possible relatives of the subject, and a fear of want of clearness comes over the mind, then my speech is full of stammering.

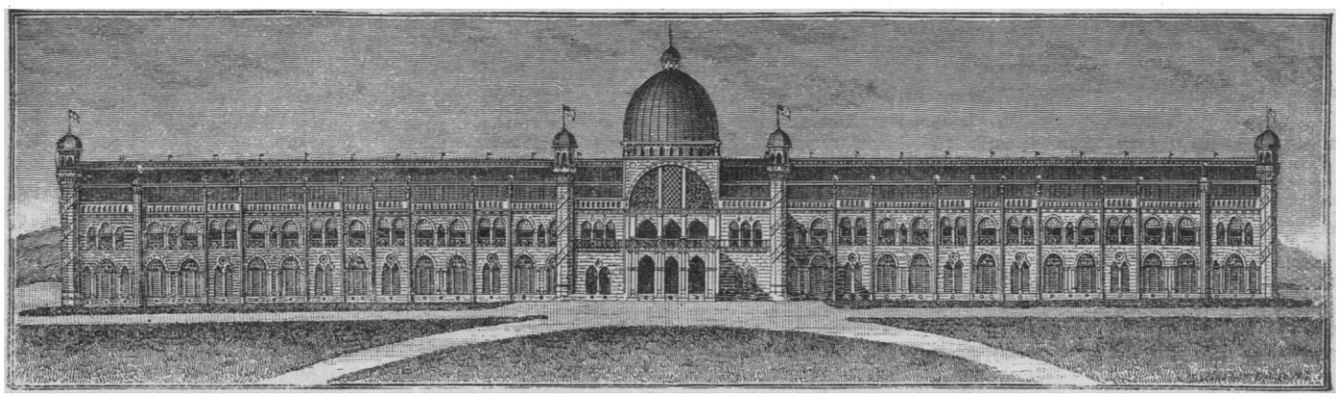
"The points which have seemed to me important toward avoiding stammering are to seek nervous calmness. If this be not attainable by the will, the sufferer can do something to divert the *præ* or present spasms; such as drawing in the breath, always keeping the lungs well filled with air in speaking, walking up and down the room, moving other parts of the body by an act of will, taking up a book or ornament, etc. I have made it a strict rule never to seek to force myself to say the difficult words, but stop and use another word or substitute some other words immediately preceding the difficult one. The sufferer should read aloud when alone both poetry and prose. Stammerers rarely stammer in reading poetry aloud when alone: the mind and nerves by poetry are induced into harmonic rhythm

just as they are by dance-music, and irregular action is prevented. The words which the stammerer finds most difficult when in society, he will find easy enough, especially in poetry, when reading aloud in his chamber. I do not think that he should practise on these words except when alone and in the most calm way: he needs rather to read naturally as it comes, to forget that he stammers, and, by practice of natural reading and speaking aloud when alone, to educate the just co-ordination of the nerves, etc. I found it best to walk to and fro in my chamber while reading aloud.''

JAMAICA INTERNATIONAL EXHIBITION, 1891.

WE again would call attention to the international exhibition which will be held in the Island of Jamaica in January, 1891, under the auspices of the Government of Jamaica. The exhibition building, shown in the illustration, is 511 feet long, with a transept 174 feet in length. The breadth across nave and aisle is 81 feet, and the height is 59 feet.

In view of the very considerable and increasing trade between the United States and the West Indies, the committee have appropriated a large space for American exhibits, and consider this an opportunity which those who are interested in introducing American manufactures and extending the export trade of the United States should not fail to take advantage of. No charge will be made for space in the exhibition buildings, nor will duties be levied on any of the exhibits unless sold in the island. The geographical position of the island and the salubrity of the climate will undoubtedly attract a large number of visitors from the neighboring islands and South and Central America, as well as from the United States. There is constant and regular communication by steam between New York and Jamaica, and the island is also connected with the United States by cable. In addition to the present accommodations for visitors, a large hotel has been recently erected and opened near the exhibition grounds, under American management. The railroad system of the island, which has been recently taken over by an American company, is rapidly being extended. The regulations of the committee, and full information as to the mode of shipment, rates of freight, and marking of exhibits, and all other particulars as to the scope and object of the exhibition, will be furnished by the secretary to the committee for the United States, Thomas Amor, 280 Broadway, New York.



JAMAICA INTERNATIONAL EXHIBITION BUILDING.

NOTES AND NEWS.

THE next annual meeting of the American Society of Microscopists will be held in Louisville, Ky., Aug. 12 to 15 inclusive. There is such activity on the part of the officers of the society, and such interest has been shown by many Southern microscopists, that a large meeting is quite assured. An interesting programme will be perfected and a pleasant entertainment provided, so that those who attend may combine relaxation with profitable work.

— The following notes on icebergs and field-ice in the North Atlantic have been prepared principally from information obtained by Ensign Hugh Rodman, U.S.N., during his recent trip to Halifax and St. John's. By January the body of the ice interfered seriously with transatlantic navigation, and its general southern limit was found in latitude 45° north, longitude 48° 30′ west. By February it had reached latitude 42° 30′ north, longitude 49° 30′ west, and at present it is in latitude 41° 30′ north, from 50° to 56° west. This extreme southern position, in January, is about two months in advance of the average. The Dundee whalers that passed last summer in Greenland waters reported, on their arrival home in October and November, a very open season in the Arctic, with more bergs than had been seen in previous years. By August and September these bergs had reached the coast of Labrador, and were seen in great numbers in their regular southerly drift in the Arctic current. This would account for their appearance near the transatlantic routes in December and January. The past winter has been the most severe, both as to temperatures and winds, that has been experienced for years in Labrador and Newfoundland. Ice in the Gulf of St. Lawrence has rendered navigation in those waters impossible, and the outflow to the southward through Cabot Strait has sent large fields of heavy ice in almost a continuous stream to the southward and westward since January. Much of this ice is four or five feet in thickness, rough, rafted, and closely packed. Field-ice, especially when rough, is more affected by wind than by current, while with bergs the reverse is the case. From this it is evident that the drift of the bergs could have been foretold some months ago, had early reports been received; while the drift of field-ice can best be predicted by telegraphic or other reports that come in promptly to a central office, where weather-charts are at hand to indicate the force and direction of the wind. Following the ice made on the Labrador and Newfoundland coasts comes the Arctic field-ice, heavier and more dangerous than the former, and its arrival is daily anticipated. The quantity of field-ice to the southward of 44° north will probably grow less from this time on, though vessels entering the fields should keep a sharp lookout for heavy, deep-blue, low-floating pieces of ice, called ''growlers,'' that appear as fragments of bergs, or the advance pieces of Arctic ice: these mingle with the coast-fields at this time, and are especially dangerous, as they are hard to distinguish. Through the exertions of the Hydrographic Office, co-operation has been effected with the lighthouse service of Newfoundland, from which monthly reports of ice and weather will hereafter be obtained; with the sealing fleet, which will probably first sight Arctic field-ice; with a number of whalers who spend each summer in the Arctic; and with the Labrador and Newfoundland fishing-fleet. From these sources, and with a hearty co-operation of masters of vessels sighting ice at sea, there seems to be no reason why, in future, the position of the ice cannot be predicted by the Hydrographic Office with still greater accuracy than hitherto.

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Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and twenty copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

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CONTENTS:

MENTAL SCIENCE.

The Time-Sense.

A GREAT deal of experiment and discussion has been expended upon the means by which we estimate time-intervals. Different observers have obtained quite opposite results, and the entire problem seems to become more complex as study is expended upon it. The usual form of experiment consists in reproducing various intervals, as produced by the beats of a metronome or otherwise, as accurately as possible under different conditions. The difference between the true interval and the average of the reproduced intervals is then calculated, and measures the constant error; while the average deviations of the several reproductions from their mean measures the variable error. The intervals thus tested were usually very brief ones, rarely being as long as a minute. On the other hand, we have an idea of time from the relative filling-out of the interval with mental experiences. A time during which much has happened seems long: one during which little has happened seems short. The latter may be regarded as a truly mental mode of estimating intervals; but it will be readily seen that it is only roughly approximate in character, and is not applicable to such small intervals as those usually experimented upon. What, then, is the means by which we gain our notions of the duration of these short artificial time lengths; such, for instance, as we employ in music and other rhythmical occupations? This is the problem that Dr. Münsterberg has recently studied in quite an original way.[1] His reflections upon the matter led him to the opinion that for these brief intervals we have no time-sense in the strict sense of the word, but that our estimates depend upon the feelings of tension, of arrest or delay, of ordinary physiological functions; and according as the end of the interval comes upon the rise or the fall of this tension-wave will a time-interval change its character. It is rather difficult to more accurately specify the subjective feelings which one experiences in waiting for intervals or in following them, but one factor most readily observed is the variation in breathing. We have all had some experience in the change of the breathing-rate under different emotions. Breathing, too, being one of the most constant bodily rhythms, it is not improbable that this affects our notions of time. To test this, Dr. Münsterberg arranged his apparatus in the usual way, first giving an interval varying from 6 to 60 seconds, and then having the subject mark off an interval equal to it: the average error in so doing was 10.7 per cent. He now had the experiments so arranged that the second sound, closing the original interval, came at the same respiratory phase as the first or opening sound of the interval: then the error was only 2.9 per cent. In this series the sound closing the original interval was at the same time the sound opening the reproduced interval. In a following series of experiments each interval had a separate opening and closing sound. When no attention was paid as to the concurrence in the respiratory phase of the opening and closing sounds, the error was 24.0 per cent, while when this was taken into account the error was only 5.3 per cent. In a third series the attention was purposely withdrawn from the respiratory and tension feelings, and the time judgments became utterly confused. While these experiments are too few to be taken as at all decisive, they certainly suggest a very interesting field of research, and, furthermore, open out some possibility of explaining the various results of different observers.

Visual Space Measurements.

The sense that above all others gives us our knowledge of extension in all the dimensions of space is the sense of vision; but, as we approach the problem more carefully, we see that there are several modes of perceiving sensations of length by the eyes. There is, first, the passive impression of a length upon the retina, which is analogous to the impression on the skin when an object, such as the edge of a ruler, is in contact with it. In both cases it is very essential to the notion of extension thus formed on what part of the skin or the retina the image is impressed. There are finely and coarsely sensitive portions of both skin and retina; and the general law is, that the same amount of objective stimulation will give a more extended sensory effect upon the more finely sensitive surface. The centre of the eye is by far the most sensitive portion, and hence we habitually turn the eyes so that the object to be seen falls upon it; and it is the space-sense of this portion of the eye that is usually tested. We have, again, the perception of space from the muscular effort needed to move the eyes so that the beginning and end of the length shall successively fall upon the fovea or central spot. In both these cases we must, to complete our estimate of length, take into account the distance of the object from the eyes; for size and distance are inversely dependent upon each other, and each becomes inferrible only when the other is known. Again, we have two eyes, which we ordinarily use together, but which we can use separately. The distances judged may be varied to an equal extent; they may be of any stated length within ordinary limits,—may be complete continuous lines, a series of points, or simple terminal points marking off a distance between them; they may be horizontally, vertically, or diagonally arranged; they may be symmetrically or asymmetrically situated with reference to the central axis of the eyes; and so on. It is evident, then, that we exercise our power of estimating distances by the eye in a large number of complex ways, and that to introduce system into the problem of how these estimates are made it is necessary to test the space-sense of the eye under different and definite conditions. This Dr. Münsterberg[1] has recently attempted by the following method. Two small squares of cardboard are seen on a green ground with a

[1] H. Münsterberg, Beiträge zur Experimentellen Psychologie, Heft 2.

distance varying by 10 millimetres, from 10 to 200 millimetres. and the attempt is then made to set another pair of squares at an equal distance apart under the most varying conditions, the average constant error and the average variable errors being carefully calculated in each case. Of the very many points arising from the 20,000 observations thus made, only a few can be here noticed. A striking result is, that no difference, however slight, in the method of viewing the lengths, is without its effect upon the accuracy with which a distance can be reproduced All the variations above noticed were tried, and showed a difference in the accuracy of reproduction. though of course some of the variations have much less effect than others. Quite a constant result with Dr. Münsterberg is an overestimation of distances on the left, and an underestimation of distances on the right. This he explains as due to the constant practice, in reading and writing, of moving the eyes from left to right. This results in making this movement easier, and, according to the general law, the movement made with more effort will seem the longer. If, then, the eye is forced to start at the middle of the length, and move towards each side, the space on the left will seem larger than that on the right. When the distances are reproduced by each eye separately, distances on the right are overestimated by the right eye, and on the left by the left eye. This is probably due to the greater ease of each eye to direct the gaze towards the common field of vision. If an interval elapses between the sight of the standard length and its reproduction, the accuracy is much diminished, and the lengths are generally overestimated, especially the smaller ones. If the original and the reproduced lines occupy the same positions, the error is least. Broken lines seem too long, as is the usual illusion. Vertical distances are overestimated as compared with horizontal ones; but this only when the vertical is above the horizontal, and the eye is free to move. All this refers to the constant error. Regarding the variable error, which measures the uniformity of the reproductions, it is very much larger when the eyes are fixed than when they move freely. This is due to the increased accuracy of the muscle-sense over the retinal sense of space, as well as to other causes. The law holding in many other kinds of sensations, that the error depends for its absolute size upon the length reproduced, seems to hold of space-sensations, but is probably a law of the motor adjustments rather than of the retinal sensibility. These selected points must suffice to indicate the scope of this very extended and critical research.

HEALTH MATTERS.

Insanity in Australian Aborigines.

IN a paper read before the Intercolonial Medical Congress of Australasia, Dr. Morton Manning, the inspector-general of the insane in New South Wales, gave a most interesting account of the cases of insanity found to have occurred among the aborigines of Australia. Mental disease would appear to have been a very rare affection while they were in their primitive and uncivilized condition, and the manner in which they dealt with the few cases which did arise was of the most drastic nature. "If the lunatic was violent or aggressive, he was promptly slaughtered; if melancholy, he was allowed, if so disposed, to commit suicide; if demented and helpless, he was allowed to die; and only when quiet and peaceable, and when his erroneous ideas did not result in offensive acts, was he allowed to continue in the tribe." In the course of time, as the aborigines were brought more into contact with civilization and its attendant vices, insanity increased rapidly in proportion to the number of the population; and Dr. Manning states that since 1868, 18 aborigines had been admitted into the asylums of New South Wales, from a population which has never during that time exceeded 2,500, and is now less than half that number. In the census year 1881 the proportion of the aboriginal insane to the aboriginal population of New South Wales was 2.83 per thousand, a proportion in excess of that for the general population; and at the close of 1887 it was upwards of 5 per thousand. The causes of insanity in the 32 cases of aborigines admitted into the asylums of Queensland and New South Wales were in a considerable proportion of the cases due to drink. The prevailing type of the malady was mania, passing rapidly into dementia. All the melancholic cases originated in jail. Three were epileptics. No case of general paralysis, or any thing like it, was seen. There were 20 deaths; and in several cases the only cause which could be assigned was marasmus,—a gradual wasting without tubercular or other manifest ailment. The average duration of life was much shorter than in Europeans; the confinement, though tempered by many unaccustomed comforts, being apparently the great factor in shortening life.

Dietary for the Nervous System.

The nervous tissue requires for its constitution, says the *Dietetic Gazette* for January, the chemical constituents of the albuminoids and fats, together with phosphorus: hence the chief alimentary substance is the albuminoids (provisional formula $C_{72}H_{112}O_{22}N_{18}S$) contained in milk, eggs, cereals, the juices of vegetables, and the muscular substance of meat. Water should be freely indulged in by neurotic types of constitution almost *ad libitum*. Among the meats most suitable are, in their order, beef, mutton, lamb, and pork, and the brains of animals. Fish is not so valuable as reputed, but may be employed to vary the diet. Oysters, on the other hand, are extremely useful as nerve reconstructives. Among vegetables, wheat stands at the head of the list, containing, as it does, fatty matters and phosphoric acid. Rice, corn, oat-meal, barley, and sweet-potatoes are better than onions, carrots, beets, turnips, etc. Fruits are useful as adjuvants because of the sugars they contain.

Removal of Warts by Electrolysis.

Dr. Patrzek of Oppeln describes, according to the *Weekly Medical Review*, his method for removing warts by electricity. The wart is first thoroughly moistened with a warm solution of salt. Both needles are then thrust through it just above the surface of the skin, and the current turned on, one element after another being added until pain is felt. Five cells are sufficient. With most cases two sittings of five minutes each are sufficient to destroy the growth, which gradually dries up and falls away, leaving a surface at first slightly reddened, but which later assumes the appearance of normal skin.

The Dangers of Hypnotism.

At Nuremberg a case of some public interest was tried in the police court, says the London *Lancet*. A commercial traveller while in a restaurant told the waitress to look steadily at the white of his eye, and hypnotized her. On a second occasion he repeated the experiment; but this time the sleep was so profound that a medical man had to be called, who had the utmost difficulty in rousing the girl. The commercial traveller was accordingly summoned to appear before the magistrates, and the severe sentence of eight days' imprisonment was passed on him, which will probably be efficient in checking similar performances in that region. In France the practice of hypnotizing people for amusement seems to be very common, and unpleasant consequences are frequently reported. At a supper-party in Paris one of the company hypnotized a girl, and was unable to rouse her. She was consequently taken to the house of a medical man, and after a time she recovered consciousness. The whole party were taken into custody by the police, and were not released until next day. Even when hypnotism has been practised by competent medical men for remedial purposes, unpleasant accidents and ulterior consequences have again and again occurred; so much so, that an order has been issued by the French Government, prohibiting surgeons in the army and navy from practising it. It ought to be distinctly understood, both by the profession and the public, that hypnotism is not devoid of danger at the time, and not infrequently has permanently impaired the moral and emotional control of patients. A medical man is bound, before recommending hypnotism for a patient, to weigh the question as carefully as he would that of the advisability of administering an anæsthetic.

Yellow-Fever at Key West.

The history of yellow-fever in Key West (being the most exposed point in the United States) dates from a very early period. The frequent occurrence of epidemics of this disease, the recurrence of isolated cases between epidemic periods, its recent reappearance in October, 1889, and during the month of January, 1890, point, in the opinion of Dr. J. L. Posey of the United States Marine Hospital Service, to but one rational conclusion,— that the disease has finally become endemic in Key West.

BOOK-REVIEWS.

Physiognomy and Expression. By PAOLO MANTEGAZZA. (Contemporary Science Series.) New York, Scribner. 12°. $1.25.

THE author of this work, who has published others on related topics, remarks in his preface that he "takes up the study of expression at the point where Darwin left it, and modestly claims to have gone a step further." He begins by sketching the history of the study, giving, as it seems to us, altogether too much prominence to the astrologists and other fanciful writers, but assigning the highest place to Darwin. His own work is divided into two parts, the first treating briefly of the anatomy of the face and the various features, while the second and much larger part deals with expression strictly so called. In this second part we find a great wealth of facts relating to the outward signs of various emotions, evidently collected with great care, and showing great keenness of observation; and, so far as our own experience and knowledge enables us to judge, these statements of fact are for the most part correct. They are also well classified and arranged; and, as a description of expression in its various phases, the work can be well recommended. We look in vain, however, for any attempt at explaining the modes of expression. The author quotes Darwin's theories, which, with some modifications, he accepts; but he makes almost no application of them. He also announces what he calls a law of expression, "according to which expression is the clearer and more characteristic in proportion as it is provoked by a more powerful, by a better defined emotion," which would seem to be a truism. But in the main Signor Mantegazza's work is purely descriptive, and lacking in those philosophical qualities that we find in Sir Charles Bell and in Darwin. As a storehouse of facts it will be useful; but for further light on the theory of expression we shall have to wait for some deeper thinker.

AMONG THE PUBLISHERS.

AMONG the more important articles in *Harper's Magazine* for April are "A Suit of Clothes," being one of a series of papers on great American industries, by R. R. Bowker; and "Three Indian Campaigns," by Gen. Wesley Merritt, U. S. A. These articles are handsomely illustrated. There is also a well-written and interesting article, by Richard Wheatley, descriptive of the New York Maritime Exchange.

—The Forest and Stream Publishing Company have in press "Trout and Salmon Fishing," by one of New England's best-known anglers; also a new edition of Grinnell's "Pawnee Hero Stories and Folk-Tales."

—Messrs. D. Appleton & Co. published last week "Studies in Hegel's Philosophy of Religion," with an appendix on "Christian Unity in America," by Dr. J. M. Sterrett; and "The Spiritual Sense of Dante's 'Divina Commedia,'" by W. T. Harris, LL.D.

— Messrs. Ginn & Co. announce to be ready in May "Wentworth's School Algebra." The necessity of having new plates for the author's "Elements of Algebra" has given him an opportunity to write a new book, with fresh and interesting problems, and with definitions, illustrations, and arrangements of the subject-matter like those in his "College Algebra." The work is written for high schools and academies, and is a thorough and practical treatment of the principles of algebra up to and including the binomial theorem.

—Porter & Coates have published "Life and Works of the Earl of Beaconsfield," by Judge F. Carroll Brewster. Every work of Disraeli has been sketched so as to afford condensation of plots, characters, and noteworthy passages. They have also ready, by the same author, "Molière in Outline," being a translation of all important parts of Molière's works, with notes, abridged from Van Laun and others, to which are added the arguments of the play.

— The prospect is that the exploration and conquest of Africa will be the problem of the twentieth century. Already nearly every nation has its Stanley. France has hers in the person of M. Trivier, whom she prefers, however, to call her Livingstone. An article on this "French Livingstone" by Henry Fouquier has the post of honor in *The Transatlantic* of April 1. The peaceful method employed by Trivier in his recent two years' journey across Africa is contrasted by the writer with the warlike and bloody methods of Baker, Emin Pacha, and Stanley. Following this article Caliban (Emile Bergerat) ridicules the anti-Jewish crusade, Enrico Panzacchi critically sketches the decadent school of writers, and there are extracts from the new volume of Edmond de Goncourt's "Memoirs," accounts of new novels by Zola and Tolstoï, and an interview with Louise Michel regarding her operetta, "In the Moon."

—Dr. Martineau's forthcoming book, "The Seat of Authority in Religion," will be published almost immediately by Longmans, Green, & Co. The work is addressed, not to philosophers or scholars, but to educated persons interested in the results of modern knowledge.

—"Old Friends," Mr. Andrew Lang's new book, to be issued here at once by the Longmans, is not unlike his "Letters to Dead Authors." It describes the meetings of the characters of one novelist with those of another. For example, Dugald Dalgetty tells of his duel with one of the "Three Musketeers," Barry Lyndon describes his playing cards with Allan Stuart Breck (from "Kidnapped"), and Trollope's Mrs. Proudie sets forth Becky Sharp's assault on the bishop.

— The April number of *College and School* (Utica, N.Y.) is a "Gen. Spinner number," containing two portraits of the ex-treasurer, with his famous signature appended. The general himself contributes the last article from his pen to appear in print, — an interesting reminiscence of his school-days in the Mohawk valley, where, as he says, he was "educated to ignorance." Three pages of the manuscript are reproduced in facsimile. Another facsimile reproduction is a translation, by the general, of a German poem, "*Ich bin nicht einsam wen allein.*" In his article, "The Watch Dog of the Treasury," A. G. Richmond relates an incident of the Breckenridge attack upon Washington, which strikingly illustrates the foresight of the man who was the guardian of the country's treasure. "Spinner, the Student," is an account of the formation of the general's lifelong habit of reading. L. L. Merry, in his "Recollections of Gen. Spinner," narrates in a familiar way some things which only an old friend would be likely to know. L. R. Tuttle, ex-assistant treasurer of the United States, tells how he tried to persuade the general to let Mr L. D. Ingersoll write a memoir of his life, while Louis Lombard has a word to say about the general's remarkable memory and his garretful of note-books The number is eight pages larger than usual, and contains, besides the Spinner papers, Mr. William H. Hayne's "Editor's Library Table," and the usual departments of college news, literary notes, and book-reviews.

— Messrs. Ginn & Co. announce as published last month "Sidney's Defence of Poesy," edited by Albert S. Cook, professor in Yale University. Sir Philip Sidney's "Defence of Poesy," in which, says Taine, "we meet with genuine imagination, a sincere and serious tone, a grand commanding style, all the passion and elevation which he carries in his heart and puts into his verse," has not hitherto been accessible to the school and college student in a handy and readable edition, notwithstanding the existence of one or two literal reprints of the earliest copies. The attempt is here made, by modernizing the spelling and punctua-

tion, and by providing an introduction and a copious body of notes, to enable any intelligent reader to draw profit and delight from this masterpiece of poetical philosophy. This volume will furnish an admirable introduction to a general course in poetry, or to the poetry of the Elizabethan age in particular. As one of the best specimens of the earlier Elizabethan prose, it will be useful to the student of English prose in its historical development; and as the first annotated edition of the "Defence of Poesy," in a critical text formed by the collation of the two earliest copies, it will be indispensable to libraries, public and private.

—George L. English, Edwin C. Atkinson, and William Niven, dealers in minerals, having on April 1 entered into a partnership, the business of each will be carried on by the new firm under the name of George L. English & Co., at the old stands, 1512 Chestnut Street, Philadelphia, and 739 and 741 Broadway, New York. With enlarged facilities and experience, they hope to give even more careful attention to the wishes of customers in the future than in the past.

—Messrs. Ginn & Co. announce to be published in May, "Reference Handbook of English History for Readers, Students, and Teachers," by W. H. Gurney. This work is intended as a constant companion and assistant to the reader or student of English history, affording him a rapid and easy method of placing his persons and dates before him in accurate relationship to each other, and helping him to draw them out of the maze of confusion and contradiction in which we find them in nearly all our great histories. It identifies enery prominent man from the time of the Confessor to Victoria, giving the date of his death, to whom married, and the number and names of his children. Unless the student becomes thoroughly acquainted with the characters about whom he is reading, the reading of history is apt to be confusing, uninteresting, and conflicting. The materials for this work have been drawn from Dugdale, Freeman, Palgrave, Longman, Sanford, and Townsend, and many other valuable works, the whole passed through a critical examination and comparison, in which the impossible has been rejected and the reliable retained. It saves the reader hours of study, and makes his work a pleasure.

—The Appletons have published, in their series of History Primers, the "History of Egypt," by F. C. H. Wendel. The work gives evidence of careful and conscientious study, and it is also plain in style. It has, however, the common fault of short histories,—an excessive amount of detail; the mass of petty facts and of proper names making the work confusing. It has also a more serious fault, in that it treats almost exclusively of the kings and their doings, with hardly any reference to the people. There is an account on pp. 100, 101, of a strike of laborers employed on certain government works, due to the non-payment of their wages, and there are brief references here and there to commercial enterprises; but in the main the condition and occupations of the people are ignored. The introductory chapter, which treats of the hieroglyphic writing, the Egyptian religion, and some other matters, is the most interesting and instructive part of the book; and it is a pity that the rest of it was not written on a similar plan.

—The corporation of Harvard University has authorized the publication of two monographs, which it is hoped may form the beginning of a series. The first number, to be ready in April, will be "A History of the Veto Power in the United States," by Edward Campbell Mason, A.B., instructor in political economy. Mr. Mason's work will include a chapter on English and Colonial vetoes, and a chapter on State vetoes. The body of the work is a systematic discussion of all the presidential vetoes, arranged by subject, and based on a study of the records of Congress. Then follows an investigation of the constitutional questions which have arisen out of the use of the veto power. An appendix contains a chronological list of presidential vetoes, with complete references to the journals of the two Houses, and a bibliography of the subject. In an introduction the editor, Professor Hart, will discuss the veto in modern constitutions. The second number of the series will be "An Introduction to the Study of Federal Governments," by Albert Bushnell Hart, Ph.D., assistant professor of history. This monograph will contain an historical introduction, with brief sketches of the rise and institutions of the principal federal governments which have existed from the establishment of the Greek federations to the present day. To each sketch will be appended a brief, critical bibliography. Then will follow a parallel arrangement of the texts, in English, of the four most important federal constitutions,—those of Canada, Germany, Switzerland, and the United States. There will be an appendix containing a list of special authorities on federal government, and of references to discussions in more general works. The monographs will be published by Ginn & Co., Boston.

—Our readers should remember that the only uniform edition ever published of the complete works of Walter Bagehot, in five volumes, 2,700 pages, is published by The Travelers Insurance Company, Hartford, Conn., at $5 for the set, all charges paid. The publication is supposed to be an advertising scheme of the insurance company, but how is not so evident to the layman. Meanwhile it would be a good plan for all who value Bagehot's writings to secure a set, as they are certainly cheap. There is nothing objectionable in their make-up or appearance.

— Volume VI. (1890) of *The American Journal of Archæology and of the History of the Fine Arts* will contain among its articles of interest the following: "Hittite Sculptures" and "Oriental Antiquities," by Dr. William Hayes Ward of New York; "Antiquities of Phrygia," by Professor William M. Ramsay of Aberdeen, Scotland; "Terra-cottas in American Collections," by Salomon Reinach, Museum of Saint-Germain, France; "Reminiscences of Egypt in Doric Architecture," by Professor Allan Marquand of Princeton; "Three Heads of Zeus, Hades, and Poseidon, of the Hellenistic Period," by Professor Adolph Michaelis of Strassburg; "Excavations and Discoveries made by the American School of Archæology at Anthedon and Thisbe, in Bœotia, Greece," by Professor F. B. Tarbell of Harvard University and Dr. J. C. Rolfe of Columbia College; "Greek Sculptured Crowns and Crown-Inscriptions" and "Distribution of Hellenic Temples," by Dr. George B. Hussey of Princeton; "Norms in Greek Architecture," by Professor Marquand and Dr. Hus ey; "The Recently discovered Early Christian Palace under SS. Giovanni e Paolo, at Rome," by Padre Germano of the Order of Passionists; "The Lost Mosaics of Rome from the Fourth to the Ninth Century," by Eugene Müntz of the Beaux-Arts, Paris; "Cistercian Monuments as the Earliest Gothic Constructions in Italy," "Roman Artists of the Middle Ages," "Christian Mosaics," and "Tombs of the Popes at Viterbo," by Professor A. L. Frothingham, jun., of Princeton. Being the organ of the Archæological Institute of America, and the medium of direct communication from the American School at Athens, this work has an increasing popularity among general readers as well as specialists.

—The United States Bureau of Education has issued two circulars of information that may interest some of our readers. One is "The History of Federal and State Aid to Higher Education in the United States," by Frank W. Blackmar, giving an account of the various grants of money and other valuables in aid of universities and other higher institutions since the first settlement of the country. The work bears the marks of careful study and preparation, and will be useful to educational specialists; but the style is so unattractive that we fear the book will not have many readers. The other circular referred to is the "Proceedings of the Department of Superintendence of the National Educational Association" in Washington last spring, and contains much interesting matter. One of the leading topics discussed was manual training, both sides of the controversy being represented, and some important points elucidated. Perhaps the ablest paper was that of Dr. William T. Harris on "The Psychology of Manual Training." The author expressed the wish not to take part on either side of the pending controversy, but sought to ascertain what manual training could and could not do for the development of the mind. His conclusion was that though manual work may to some extent train the hand and the eye, yet the essential part of intellectual education is the training of the reflective faculties, to which manual work can contribute little or nothing. Most of the speakers and essayists were in favor of special industrial schools in places where there was sufficient de-

mand for them, but against the adoption of manual training as a part of the general educational course. At the close of the discussion one of the members moved that a committee of the association be instructed to define the term "manual training," which would certainly seem to be a proper and even necessary thing to do, if there is ever to be an agreement about the expediency of such training. But the motion raised a perfect storm of opposition, so that the chairman had to interpose a few remarks to prevent an acrimonious dispute. Another important subject treated was that of examinations, especially the examination of teachers, which was recognized as at once a work of great importance and of great difficulty. Candidates for the position of teacher are now often examined by persons with no real fitness for the task, and some remedy for this evil is undoubtedly necessary. Besides these topics, the assembled superintendents discussed the training of teachers, the duties of principals, and other themes that need not be specified here.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Heat and Ventilation.

IN your issue of Feb. 28 is a notice of the Timby system of heating and ventilation, which, you say, "is now attracting universal attention, especially in New England." It is to be hoped that New England will not miss the delicate touch of flattery perhaps unconsciously given her in this quotation, and that your columns are open to any voice of intelligent response which may come back from her.

The attention of which you speak is not stated to be that of competent engineers, nor that of others better qualified than "ex-mayors" to judge of the merits of the described system. It is not defined as that of either scientific sanction or condemnation.

But the appearance of the article in *Science*, and without unfavorable comment, would seem to the popular mind to lend a quasi-scientific approval to the enterprise, as it doubtless has afforded gratification to its promoters.

The art of ventilation has suffered much injury at the hands of many whose ingenuity has not been the well-trained servant of a sound scientific knowledge. The field is a fertile one for the culture of schemes and methods more visionary than practicable, and more gratifying to inventors than profitable to users. To protect the public against imposition, to save the popular mind from discouragement through repeated and costly failures, to expose and weed out the worthless methods from the good, and to establish popular faith by evidence of actual or possible success in any worthy undertaking, is a legitimate and laudable service for any man or journal capable of rendering it.

To this end it would afford satisfaction to see in your columns a thoroughly trustworthy discussion of the applicability of the Timby system to the actual necessities of good ventilation and heating. With a view to eliciting contributions to such a discussion, the following propositions are submitted : —

First, The mechanical part of the problem is beset with insuperable difficulties of various sorts, some of which are closely akin to those belonging to the long ago demonstrated impracticable scheme of ventilating a city's sewers by a centrally located system of pneumatic exhausters.

In the company's pamphlet, and under the head of "Plan of Introduction," the statement is made that it is proposed to heat and ventilate a town of 50,000 inhabitants by means of one centrally located plant.

The first essential in ventilation is an adequate air volume, and the second is an effective use of it. If the dermal and thoracic excretions are to be diluted to one in two hundred, — a proportion of diluent which for the pelvic excretions would be considered far too small to fit them for potable or edible use, — the air-supply for such a town should be 150,000,000 cubic feet per hour; and for the sweetening of the 2,000 buildings of 50,000 cubic feet capacity each, in which the inhabitants may, for the purposes of computation, be supposed to compactly live, the air-supply should reach at least that quantity. Let it be reduced to 100,000,000, and, for the sake of simplifying the mechanical problem, let the houses be ranged along two intersecting streets, 500 houses to each half-street, and let the ventilating plant be located at the point of intersection. Let the houses stand in compact block form, and average, with alley and cross-street spaces, forty feet frontage. Let each of the main air-conduits be six feet in diameter, and the central supply-shaft twelve feet. The velocity of air-flow through the main conduits would be nearly 15,000 linear feet per minute, and the theoretical power required to propel the air would be about 125,000 horse-power, 4,000 being required to give the air its initial motion, and the balance to overcome the resistance of friction. This computation takes no account of the further work required for moving the air through leads to the 2,000 buildings, and through the ramifying conduits for its distribution to their several floors and rooms.

The above computations are qualified as theoretical, since it is assumed that the efficiency of the motile machinery employed is unity instead of the one-third or one-fourth usually available in such mechanism. It would be interesting and instructive to examine a description of the apparatus it is proposed to use for the propulsion of such large volumes of air under the high pressure demanded. To effect the pressure by blowers, the velocity of their blade tips would have to exceed that of a rifle-shot, and a twenty-foot diameter fan must make the quite impossible performance of 1,800 revolutions per minute.

Let the question be simplified to that of supplying air to two such buildings as the newer ones of the Massachusetts Institute of Technology, they monopolizing an entire main, and being located at its extremity. The theoretical horse-power required would be some 345, against a present actual mean of 15 or so, for the supply of 5,600,000 cubic feet of air an hour.

Second, The method proposed for warming the air supplied through the mains by means of a hot-water pipe with return bend, as shown in the cut reproduced by *Science*, and described in the company's pamphlet, is defective.

The pamphlet states that the pressure within the pipe is not to exceed five pounds, and that the heat-loss in the water is not to exceed five per cent. The statement, though somewhat ambiguous, may reasonably be made to mean that the water starting with a temperature of 227° will return to the heater cooled through 12°.

If the sole aim of this warming of the air were to raise it to the temperature of comfort, say 70°, before supplying it to the buildings, and the matter of heating the buildings were excluded from consideration, the volume of water to be moved through the pipe would, on a day of average winter temperature, be nearly 200,000 gallons an hour, or a flow rate of nearly five miles an hour through a fourteen-inch pipe.

For extreme weather this quantity must be more than doubled, and, if the heating of the buildings is to be included, the duty of the heating system must be quadrupled.

A study of the mechanical part of this heating problem is not here presented.

Presumably the small fraction of the exhaust steam from the air and hot-water propelling engines required for heating purposes would be utilized. Enough would still remain for the comfortable heating of some halfscore of adjacent towns of rival size.

A description of the arrangement of the proposed pipe or other heating surface, so that cumulative heating effect should be avoided, and a uniform temperature maintained throughout the mains, would interest many of your readers.

Third, The required inequalities of temperature in the air-supply to various buildings, and to the various parts of the same building, cannot be furnished from one supply source maintained at a fixed temperature.

For the shady or the windward side of a dwelling whose air is "changed" but once an hour, the air-supply temperature may need to be in some weathers 190° or 200°; and on the sunny or the leeward side, or in the sleeping or sick room, twenty to thirty de-

grees lower; and at the same time the air supplied to a theatre, hall, or church must have a temperature of from 60° to 80°. Hence the impossibility of meeting all requirements of both heating and ventilation with air from one supply source at a fixed temperature.

S. H. WOODBRIDGE.

Boston, March 20.

Sound-English.

IN your review of my "Sound-English, a Language for the World," in your issue of March 21, you make some statements to which, I am sure, your well-known fairness will allow me to offer a correction.

You say that I propose "to introduce at first five new letters, to be followed by six more at a later time," and that you "gravely doubt if any system can be brought into use that contains new letters; and, if new letters are to be introduced, there are other systems that have quite as good a claim to be adopted" as mine.

Now, the fact is that I do not introduce a single new letter. I distinctly state it as my idea of the "requirements of a phonetic alphabet" (see p. 21) that "the present equipment of any printing-office must suffice, without the necessity of casting new types or even employing diacritical marks," and that "all the leading type-writers now in use must be adapted or easily adaptable to the new system without destroying their usefulness in writing the present spelling." My whole system is worked out in conformity with this principle. It is the principal claim I make for its superiority over other systems. If you will kindly turn to the "specimen page" from Macaulay's "History," on p. 51, you will not find a single sign which could not be set up to-day in any village newspaper-office between Maine and Calfornia.

To distinguish *a* in *at* from *a* in *ask*, I propose a slight alteration in the type, which may be effected with a penknife; but this is a trifling matter, so much the more as we do not require any distinction between the two sounds in ordinary reading-matter.

I do not know of any perfectly phonetic system of spelling in which the same result is attained, if we except Mr. Ellis's "Glossic;" but, then, he employs vowel digraphs, while I do not employ a single vowel digraph, excepting, of course, the three regular diphthongal sounds *ou*, *oi*, and *ai* (in *aisle*).

I do propose five very simple alterations for the script; and I say, further, that in course of time, when "Sound-English" will be firmly established, type-founders will provide us with more appropriate forms to designate some of the sounds; and then, merely for the purpose of offering a complete system, I venture to suggest what these forms ought to be. But I am far from advocating their immediate introduction.

As for the expediency of designating the long vowels by full-faced type, and in script by shading, it is, of course, a matter of opinion. You think it an insurmountable obstacle; for, as you say, "who will take the trouble, in rapid writing, to shade now and then a letter more heavily than the rest?" Now, in the first place, "the rest" are not shaded at all in my system. In the second place, do not many systems of stenography distinguish sonant from surd consonants by shading? And do not stenographers write rapidly?

In conclusion, I beg to call attention to the fact that I employ full-faced type and shading not only for the long vowels, but also for designating the accent,—a feature which I think to be as important as it is original; for I do not know of any system of spelling, in any language, in which the accent is thus designated, symbolically, without employing a special sign.

I hope you will not consider this as a fault-finding review of your review, coming from an author who cannot bear adverse criticism. It is intended only as a courteous request for permission to lay my own statement of the facts before the select circle of thinkers who subscribe for your excellent journal.

A. KNOFLACH.

New York, March 28.

Do the Barclayan Descriptive Terms occasion Obscurity?

IN the *American Naturalist* for October, 1889, p. 923, the notice of Stowell's cranial nerve studies concludes with the remark that "the adoption of the Wilderian adjectives and adverbs renders them somewhat pedantic and obscure." The title of this communication attributes to Barclay, the anatomical preceptor of Richard Owen, the exact descriptive terms which have been employed by many writers, and which I merely adopted in 1880 at the Boston meeting of the American Association for the Advancement of Science. The charge of pedantry is not new; but, as that is a matter of custom and taste, it may be overlooked. Since, however, the very purpose of the Barclayan toponymy was to eliminate the obscurity which lurks in every anatomical treatise or paper known to me in which those or equally exact descriptive terms are not used, I am anxious for specifications on this head, and trust they may be presented in response to this letter.

BURT G. WILDER.

Ithaca, N.Y., March 29.